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ABSTRACT

This paper reviews briefly the essential characteristics of both invitational education and computer assisted instruction (CAI) and the ways in which coordination of these two models can produce stimulating and valuable educational experiences for students. A matrix illustrates the characteristics of CAI which can support the major values of invitational education, and a series of guidelines based on invitational theory are presented for designing educational software so as to maximize humanistic use of this medium. For example, it is suggested that programers design frames to communicate one message at a time and invite student decisions as to when to proceed to the next frame; provide brief, clear user messages which do not attempt to simulate human emotions; offer real not empty user choices; preassess student entry skills and attitudes and design systems to tailor presentations to each individual learner; invite students to map their own strategies; encourage learners to ask the computer for more information than that required to pass the tests; provide a choice of incentives and rewards to meet varying student needs for praise and direction; invite easy and direct user input with devices such as a touch screen, joystick, mouse, or light pen; invite students to create their own questions, illustrations, graphics, explanations, and tests; provide clear glossaries and generic help systems; invite open dialog between users and systems; and avoid the text-question-answer pattern that negates so many efforts in both machine and human mediated learning. A 20-item bibliography is provided. (ESR)

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INVITING SUCCESS IN COMPUTER-ASSISTED INSTRUCTION

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Abstract

INVITING SUCCESS IN COMPUTER-ASSISTED INSTRUCTION

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This paper reviews the characteristics of Invitational Education and Computer-Assisted Instruction and provides a matrix of the relationship between the two. Using elements of invitational theory, it proposes guidelines for designers of educational software who aspire to ensure a humanistic use of the new medium.

The inviting message is examined as the heart of both invitational education and exemplary software and suggestions are made for using these messages to create an inviting environment which transcends machine configurations in the classroom.

INVITING SUCCESS IN COMPUTER-ASSISTED INSTRUCTION

Can a machine invite learning? Yes and no, but those who design interactive technologies for use in the teaching and learning process can and must build invitations into their programs. Designers can and should assume an invitational stance encompassing respect, intentionality, responsibility and direction in presentation modes, reinforcement, feedback loops, placement of locus of control and human-machine interactions so that the new technologies may fulfill their promise as agents and enhancers in the learning process.

This paper will review briefly the essential characteristics of both invitational education and computer-assisted instruction and the ways in which these two models are capable of cooperation to produce stimulating and valuable educational experiences for students. Guidelines for invitational programming will be suggested for designers and users of interactive, computer-assisted materials along with methods of incorporating educational software into the inviting environment.

INVITATIONAL EDUCATION

Characteristics of Invitational Education which will be incorporated into the Inviting Success in Computer-Assisted Learning model should be reviewed.

Invitational Education is a perceptually based, self concept approach to education whose four basic principles as described by Purkey and Novak (1984) are:

1) people are able, valuable and responsible and should be treated accordingly
2) teaching should be a cooperative activity
3) people possess relatively untapped potential in all areas of human development
4) this potential can best be realized by places, policies and programs that are specifically designed to invite development and by people who are personally and professionally inviting to themselves and others

"An inviting message presents something beneficial for consideration and acceptance. An inviting message is a 'doing with' rather than a 'doing to' process. It is an effort to establish cooperative interactions." (Purkey and Novak, 1984, p.4). People receiving these messages have opportunities to participate meaningfully in worthwhile activities.

The levels of functioning categories described by Purkey and Novak are intentionally disinviting, unintentionally disinviting, unintentionally inviting and intentionally inviting. Professionals are invited to become aware of the level of their messages and to learn to make their messages congruent with their intent.

Invitational education theories are grounded in the perceptual approach to understanding behaviour. Behaviour is based on perceptions. In order to succeed, the learner must feel and believe that she is capable, valuable and responsible. Perceptions are learned. We, as educators, are as responsible for affect as we are for cognition. We should always build on the intrinsic human need to grow and learn.

The inviting teacher reads and flexes. Student behaviour and style is responded to in the full awareness that each of us learns differently. Invitations often arise from an "If... then..." statement in the teacher's mind which extrapolates directions and styles from current behaviour and characteristics.

In essence, the value and emphasis of invitational education lies in the stress on messages - intended, extended, received and acted upon.

In his paper, Revisioning Invitational Education, John Novak states that, "the basic unit of analysis and prescription in invitational theory is the message", (1983). Messages may be arranged along a continuum according to their perceived role, intentionality, dependability, integrity, creativity and subtlety. An understanding of message systems is useful, indeed essential, to those who wish to be intentionally inviting.

NEW TECHNOLOGIES IN EDUCATION

Computers have been used to assist instruction for many years now. It is not tomorrow's teachers who must integrate technology into the school. It is us - those of us teaching today. Early educational software was noteworthy for its unwillingness or inability to extend invitations to learners. This is evidence not of an uninviting medium, but uninviting designers and programmers.

Today's technologies are potentially inviting. They can be used by the inviting teachers to enhance and assist the extending of invitations.

Before examining ways in which we can create this balance between humanism and technology, a review of some of the characteristics of Computer-Assisted Instruction is in order.

Many people today believe they understand the meaning and significance of CAI, yet few (even teachers) have ever been the student in a CAI lesson or used the medium in the classroom. To many, CAI evokes an image of a student in front of a beeping machine digesting dry tutorial material and answering multiple choice questions by typing responses onto a keyboard. The computer in this image, points out errors, records student performance and provides more examples.

Behavioural psychology was the prominent school of thought at the time CAI began and most programming reflects this orientation. Stimulus-response-reinforcement remains the major pattern of interaction, even though there is little solid evidence that the S-R

theory works for higher order human cognition (Burke, 1982, p.23)

Among the most commonly promoted features of CAI are:

- individualized instruction
- ability for endless repetition
- student control of process
- instant feedback
- cost effectiveness
- individualized remediation
- non-judgmental feedback
- record-keeping
- clear content presentation
- simulation effect
- colour animation and graphics

More recently, behavioural theory has lost its prominent position in the minds of courseware designers. Learning styles of students and affective learning issues are being examined and researched. Interactive videotape and videodisk are being used in the design of exemplary learning tools and the way the student feels is recognized as the major determinant of learning success. The computer-assisted learning package created today can use animated colour graphics and creative screen formating capacity. Varied user interface devices such as the mouse, the joy stick and the light pen have replaced the traditional keyboard entry mode. Exemplary programs invite active learner response.

The functional modes of Computer-Assisted Instruction include six major instructional strategies:

1) drill and practice - perfection or reinforcement of previously learned material
2) tutorial - exposition of new material; question and answer
3) simulation - substitute for natural experience
4) modelling - higher level learning; analysis and synthesis
5) problem analysis - "how to solve" rather than specific solutions
6) instructional games - fostering of cooperation (or competition)

FIGURE ONE: THE INVITING COMPUTER SUCCESS MATRIX

CAI	INVITATIONAL EDUCATION: Students are able, valuable & responsible	Teaching is a cooperative activity	Students have great untapped potential	Inviting messages are the key	Positive self concept essential for successful learning
Individualized Instruction & Remediation	*			*	*
Patient Repetition	*			*	*
Student the locus of control	*	*	*	*	*
Immediate, Consistent Feedback	*			*	*
Cost Effectiveness					
Non-judgmental Feedback	*	*		*	*
Interactivity	*	*	*	*	*
Graphics, Animation			*	*	*
Variety of User Interface Media		*	*	*	*

Computer based learning is not merely a fixed system of hardware, software and courseware, but an entire educational environment which can be as inviting as the total environment in which it is placed.

Let us now look at ways in which educational technologies are compatible with the aims and values of invitational education.

INVITING SUCCESS IN COMPUTER-ASSISTED INSTRUCTION

Figure One illustrates in general terms the characteristics of CAI which can support the major values of Invitational Education.

At the conclusion of this paper, guidelines for programmers and designers to ensure that CAI does support and extend invitations will be given. This matrix shows that the compatability is possible.

Educational software can treat students as able, valuable and responsible by:

- individualizing instruction and remediation
- providing endless examples with patience
- allowing the student to make decisions about level, pace and style of learning experiences
- providing immediate and consistent feedback which is non-judgmental
- inviting active learner participation

Creating a 'doing with' rather than a 'doing to' learning environment can be achieved in CAI by:

- allowing the student to control his progress and direction by interest and need

- providing non-judgmental feedback
- stimulating and inviting active participation by the student who is the driving force in the instructional environment
- allowing the student to choose from a selection of user interface media

Computer programs can respond to the untapped potential of learners by providing opportunities for high-level interaction, cognition, creativity and self-confidence by:

- leaving the locus of control with the student as much as possible
- fostering and stimulating varied, high level responses using and inviting student use of high resolution graphics and animation

The inviting message is the heart of invitational education and the heart of exemplary educational software. Programs can make acid comments (killer statements) to students about errors or can adopt helpful, inviting, supportive stances toward students depending on the intent of the designer.

Characteristics of CAI which permit the extending of inviting messages are:

- individualized instruction and remediation
- repetition
- student control
- immediate, consistent feedback
- non-judgmental feedback
- interactivity
- graphics and animation
- variety of user interface media

The creating, maintaining and enhancing of positive self-concept so essential for learning success can be achieved through the CAI characteristics with the exception perhaps, of cost-effectiveness seen in Figure One.

The largest potential areas for the application of invitational education theory to the design of courseware as illustrated in Figure One, are locus of control and interactivity. These CAI capacities can be superb vehicles for inviting messages and the enhancement of self-esteem.

GUIDELINES FOR PROGRAMMING INVITATIONS INTO COMPUTER-ASSISTED INSTRUCTION

In order to design invitations to students using CAI, it is important that the programmer understand why interactions in human interactivity produce such quality in education. The qualities and values of invitational education can be applied to educational computer programming in many ways.

1. Computer Assisted Instruction is <u>not</u> a collection of machines. It is a total environment and must be planned carefully. The machine and peripheral configuration should invite confidence and enthusiasm. The ideal classroom computer is small, clean of line and pleasing to the eye. It should invite interaction by reducing dependence on a keyboard as the major interface device. A "mouse" or similar medium allows the

student to maintain eye contact with content messages and feel a quick and easy opportunity for control and communication. The challenge is to design accessible characteristics into complex and sophisticated hardware and software.

2. Each frame of a lesson should communicate only one message and invite the student to decide when she has read and understood and is ready to proceed.

3. A program's behaviour, like a teacher's behaviour inevitably communicates a set of attitudes toward both the subject matter and the learner. "User-friendliness" or the lack of it is most evident in the invitations extended for student input and the responses to this input.

   Messages may be authoritarian and cold or condescending and over-praising for simple tasks. Messages should be brief and clear.

   CAI messages should not attempt to simulate human emotions or blame the student for making the machine feel "happy" or "sad". The youngest learner knows that a computer is not a human and does not feel comfortable if the machine suggests that it knows him once his name has been entered.

4. When students are offered choices, the choices should be real. The inviting teacher asks for participation and provides real, not empty student choice. A blind choice is an empty interaction and contributes nothing to the student's sense of worth or responsibility.

5. Computer manufacturers proudly boast of immediate response time by machines and typically measure this time in nano-seconds. Inviting dialogue allows think time and wait time. Demands for too rapid response inhibit thoughtful reasoning. Interaction and feelings of worth suffer when response or wait time is reduced to fractions of seconds. The inviting teacher waits patiently and listens carefully.
6. Educational programmers should use what they know about human interactivity. David Hon points out that "we are not taking the time and effort to examine the <u>feel</u> of human interactivity and to use that as a prime element in every system we design." (Hon, 1983, p.21)

   Courseware Design students at Sheridan College in Oakville, Canada do not just learn computer programming. They observe and participate in live teaching situations and practice interaction analysis in human interaction before attempting to design inviting human-machine interactivity. An electronic human being will not be designed to interface with machines. More inviting CAI must be developed. It is critical to ensure that the software adapt the computer to the user rather than the user to the computer.
7. Instructional strategies used in educational programs may be inviting in several concrete ways. Programmers should follow guidelines for successful teaching by:
   a) preassessing entry skills and attitudes and designing the system to tailor the presentation to each individual learner.

b) inviting students to map their own strategies.

c) encouraging learners to ask the computer for more information than that required to pass the tests.

d) providing a choice of incentives and rewards for varying student needs for praise and direction.

e) inviting easy and direct user input through tactile involvement such as touch screen, joy stick, mouse or light pen.

f) inviting students to create their own questions, illustrations, graphics, explanations and tests.

g) providing clear glossaries and generic help systems

h) inviting open dialogue between users and system.

i) avoiding the text-question-answer pattern that negates so many efforts in both machine and human mediated learning.

8. It is interesting to note that the only empty horizontal row in Figure One is cost effectiveness. Most studies which claim to prove learning effectiveness in CAI in fact refer to cost effectiveness and productivity. Such studies claim learning time is reduced by CAI in relation to classroom instruction and that this saving increases productivity and reduces cost from twenty to twenty-five percent. Programs are designed to be flexible in speed and level of presentation to maximize this productivity.

A current study by the author attempts to demonstrate that educational computer programs can and must be designed to flex not only to learner speed and level, but to individual learning styles.

It is possible, for example, to construct a series of "If... then..." statements to plan presentation modes which fit Kolb's four main learning styles. A simple pre-activity on the program allows the learner to indicate a natural or preferred style of learning. The program can then vary instructional strategy, degree of familiarity, tone of messages, type of feedback and methods of evaluation according to the preferred style. This study should prove valuable to those wishing to gain optimal invitational effect from CAI.

FINAL STATEMENT

A study by John Goodlad, Dean of the Graduate School of Education at UCLA (Scanland and Slattery, 1983, p.7) indicates that our often wistful perceptions of the "normal" North American classroom are sadly incorrect. From a study of thirty-eight schools and a thousand classes, researchers concluded that:

> "Affect was virtually absent from American classrooms. Feedback-with-guidance associated with helping students understand and correct mistakes was essentially non-existent. In students' exposure to approximately two hours of teacher talk during a five period day, seven minutes on the average involved teacher responses to individual students." (Scanland and Slattery, 1983, p.11)

It would be a gross fallacy to assume that having a human teacher in the classroom ensures invitational education or that having a machine in the classroom is dichotomous with invitations being sent and received.

The inviting teacher will welcome the advent of quality educational computer programs which will aid and abet the establishment of the total inviting environment.

> "I now believe there is no biological, geographical, social, economic, psychological, or technical determiner of mans' condition that he cannot transcend if he is suitably invited or challenged to do so."
>
> Modification of -
> Sidney Jourard,
> Disclosing Man to Himself,
> (1968, p.58)

The challenge is with us now. We are invited to use technology for our purpose - to support and extend the values of invitational education.

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